



TUBULAR COUPLING ELEMENT FOR PRODUCING A GLUED JOINT WITH A FLUID LINE

[Description]

Background of the Invention

5 Field of the Invention

The invention pertains to a tubular coupling element for producing a glued joint with a fluid line[, wherein the]. The coupling element [consists of] includes an inner tube that can be inserted into [the] a fluid line and an outer tube that is [realized] concentric to the inner tube and integrally formed on the rear end of the 10 inner tube with a closed ring.

Reference to Related Art

A coupling element [of this type] is known from [DT] DE 26 03 299 A1. In [this] that case, [the] an annular gap between [the] an inner tube and [the] an outer tube is filled with a liquid adhesive[, namely such a quantity of the adhesive] 15 so that the respective intermediate spaces between the fluid line and the inner tube and the outer tube are entirely filled out after the fluid line is [pressed in] inserted. The adhesive [consists of] has two liquid components that are held in the annular gap by removable [separating and] cover films. The utilization of liquid adhesive components has the disadvantage in that the films initially need to be removed at 20 the construction site before the tubular end of the fluid line can be inserted into the annular gap. In addition, the tubular end of the fluid line and the coupling element need to be held in an axially aligned position until the adhesive has hardened. One also needs to proceed very carefully when filling in the annular gap with the adhesive components[, when] by correctly metering [said] the components and 25 [when] by sealing the annular gap in an air-tight fashion.

A tubular coupling element [of this type] is also known from DE 44 42 407 C1. In [this] that case, [the] an annular gap is filled with a hardenable sealing or binding agent and then closed with a removable air-tight cover. [This] However, this method also results in the aforementioned disadvantages[, namely]

5 in that the cover film initially needs to be removed at the construction site before the tubular end of the fluid line can be inserted into the annular gap [in order] to produce the glued joint.

Summary of the Invention

The present invention [is based on the objective of realizing and filling the] is directed to the filling of an annular gap with a suitable adhesive in such a way that [the] a coupling element[s] can be rapidly and easily connected to the end section of a fluid line.

[According to the invention, this] The objective is attained by filling [the] an annular gap between [the] an inner tube and [the] an outer tube with a dry 15 hot-melt adhesive that is compacted into the shape of a solid ring.

[Due to these measures, a] A glued joint between the end of a fluid line and the coupling element can be produced in a much simpler and less expensive fashion than with the state of the art. Since the hot-melt adhesive is introduced into the gap in the form of a solid compacted ring, it can [also] be retained therein 20 without cover elements and reactivated for use at any time by applying heat.

[The] A method according to the invention [also] makes it possible to easily connect fluid lines and coupling elements to one another [if the coupling housing consists of]. The method is particularly advantageous when the coupling element is constructed of a plastic material and the fluid line [consists of] is constructed of

an aluminum tube or a metal tube that is encased with plastic as is increasingly utilized in modern technology.

The [dependent claims disclose] invention also teaches various advantageous additional developments [of the invention] that serve for achieving
5 the individual advantages described below[:].

[According to Claim 2, the] Specifically, the design of the inner tube serves for producing a centered contact with the end [region] section of the fluid line while the hot-melt adhesive is able to distribute between longitudinal ribs.

10 The design of the outer tube [in accordance with Claim 3] makes it possible for the adhesive inserted between the inner tube and the outer tube to flow outward along the ribs when it is subjected to heat such that a uniform distribution of the adhesive is ensured.

15 [The] Finally, a method for producing a glued joint [proposed in Claim 4] advantageously describes how the ring of adhesive introduced into the annular gap can be rapidly heated while the fluid line is inserted, and how the end of the fluid line can be properly pressed into the melting adhesive.

Brief Description of the Drawings

One preferred embodiment of the invention is illustrated in the figures and described in greater detail below[. The figures show:], wherein:

20 [Figure 1,] FIG. 1 is a side view of a coupling housing with a partial section through [the] a coupling element along the line I-I in FIG. 2 [Figure 2];

[Figure 2,] FIG. 2 is a lateral section view through the coupling element along the line II-II in FIG. 1 [Figure 1];

25 [Figure 3,] FIG. 3 is a longitudinal section view through a compacted adhesive ring to be inserted into [the] an annular gap of the coupling element;

[Figure 4,] FIG. 4 is a schematic presentation of a coupling housing with [a pressed-in] an inserted adhesive ring;

[Figures 5 and 6, the] FIGS. 5 and 6 are side views demonstrating a sequence of producing a glued joint between the coupling element and [the] a 5 fluid line;[,] and

[Figure 7, the] FIG. 7 shows a side view of a finished glued joint between the fluid line and the coupling element.

Detailed Description

[Figures 1 and 2 show] Referring now to FIGS. 1 and 2, there is shown a 10 tubular coupling element 1 that is integrally connected to a coupling housing 2 [of plastic]. As indicated in [Figure] FIG. 7, [this] the coupling element 1 serves for producing a glued joint with a fluid line 3 that, for example, [consists of] includes an aluminum tube or another suitable metal tube. The coupling element 1 may, however, also be integrally formed on a plug-in element (that is not illustrated in 15 the figures) and conventionally inserted into the coupling housing 2 in order to produce a separable plug-type connection.

[The] Still referring to FIGS. 1 and 2, the coupling element 1 [consists of] includes an inner tube 4 that is inserted into [the] a free end 20 of the fluid line 3 and an outer tube 5 that is [realized] concentric to the inner tube 4 and connected 20 to the rear end of the inner tube 4 by [means of] a [closed ring] connecting wall 6.

[On its] An outer surface 7[,] of the inner tube 4 [contains] preferably includes at least three longitudinal ribs 8 that serve for producing a centered contact with the inner wall 9 of the fluid line 3 when it is pushed over the inner tube 4 ([Figure] FIG. 6).

[On its inner side,] As seen in FIG. 2, the outer tube 5 is provided with a series of axially parallel grooves 10 having peaks 11 that are distributed over the [circumference, wherein the summits 11 of said grooves have an inside diameter d2 that is a] inner surface of the outer tube 5. The inside diameter of the inner surface between opposing peaks 11 is slightly larger than the outside diameter D of the fluid line 3. The length of the outer tube 5 preferably corresponds approximately to the outside diameter D of the fluid line 3[, wherein] such that the inner tube 4 is longer than the outer tube 5 by approximately one-half.

[In order] Referring now to FIGS 1-3, to produce a glued joint between the tubular coupling element 1 and the fluid line 3, [the] an annular gap 13 between the inner tube 4 and the outer tube 5 is filled with [the] a hot-melt adhesive to approximately half its depth[, wherein the]. The hot-melt adhesive is introduced into the annular gap 13 in the form of a compacted solid ring 14 ([Figure] FIG. 3). The outside diameter D1 of [this] the ring 14 is slightly smaller than the inside diameter d2 of the [summits] peaks 11, [wherein] and the inside diameter d1 of the ring 14 [approximately] corresponds approximately to [the] an inside diameter d of the fluid line 3. The width B of the ring 14 has such dimensions that the ring 14 fills out approximately half the depth of the annular gap 13.

[After] Referring now to FIGS. 3 and 4, upon inserting the ring 14 into the annular gap 13 in the direction of the arrow P, the ring 14 is pressed into the gap 13 until it contacts the connecting [ring] wall 6 ([Figure] FIG. 4)[, preferably]. The ring 14 is preferably pressed into the gap 13 with the aid of an auxiliary tool 15 that contains [a few] circumferentially distributed pressing elements 16. [The] Following insertion of the ring 14, the coupling element 1 [which is now filled

with the adhesive] is ready for gluing to the free end 20 of the fluid line 3. [The sequence of this gluing process is illustrated in Figures 5 and 6.]

[The] As shown in FIGS. 5–7, the coupling housing 2 is initially held in position with a coupling holder 17 while the fluid line 3 is moved into [the] a
5 position opposite [position along an imaginary extension of] the coupling housing 2 axis [by means of] through the use of a tube holder 18. An induction coil 19 is [now] then placed around the free end 20 of the fluid line 3 such that the tubular end 20 of the fluid line [can be] is preheated ([Figure] FIG. 5).

The coupling element 1 is [then] pressed on the free end 20 of the fluid line 3 in the direction of the arrow M by means of the holder 17 and [thusly] is surrounded by the induction coil 19. The adhesive ring 14 melts due to the thermal effect generated by the induction coil. While the tubular end 20 of the fluid line 3 penetrates into the hot-melt adhesive, the adhesive is displaced on the inner wall 9 and the outer wall 12 along the ribs 8 and the grooves 10 in the 15 inserting direction M. This causes the intermediate spaces between the tubular end 20 of the fluid line and the coupling element 1 to be completely filled out with the hot-melt adhesive ([Figure] FIG. 6).

After the hot-melt adhesive has set and pre-hardened, the process of connecting the coupling element 1 and the fluid line 3 is concluded [to such a degree] such that the holders 17 and 18 can be removed [for a possibly required hardening process] and the adhesive permitted to cure ([Figure] FIG. 7). The coupling 2 with the fluid line 3 glued thereto can then be transported to the site of its intended use.

In the embodiment shown, the tube holder 18 is [symbolically illustrated in 25 the form of] shown as a solid body with a [so-called] blind hole[,] into which the

fluid line 3 is inserted with its outgoing end. However, the tube holder may also [consist of] include a clamping element that surrounds the fluid line 3, e.g., a pipe clamp. This is particularly advantageous if the fluid line 3 has a greater length than shown in [Figures] FIGS. 5 and 6.

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I claim:

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